21(8) SOV/56-36-6-9/66

AUTHORS: Rymko, N. P., Tulinov, V. F., Charakhch'yan, A. N.

TITLE: A Case of a Sharp Intensity Increase of Cosmic Radiation in the Stratosphere (Sluchay bol'shogo vozrastaniya intensivnosti kosmicheskogo izlucheniya v stratosfere)

PERIODICAL: Zhurnal eksperimental'noy i teoreticheskoy fiziki, 1959, Vol 36, Nr 6, pp 1687 - 1689 (USSR)

ABSTRACT: On July 8, 1958 an unusually sharp intensity increase of cosmic radiation at high altitudes and a geomagnetic latitude of 64°N was detected by the Loparskaya station (Severnaya nauchnaya stantsiya AN SSSR (Northern Scientific Station AS USSR)). Measurements were carried out by means of a Geiger-Mueller counter and a radioprobe for cosmic radiation RK-1 (as described in reference 1). Figure 1 shows the results of measurements, which are compared with the curve obtained by measurements carried out on March 1 and July 7. In an altitude of 30 km the intensity was double the normal value. Analogous measurements were carried out by means of the stratospheric probe RK-1 in the stratosphere on July 8 by the station Dolgoprudnaya (near Moscow), nauchnaya stantsiya Fizicheskogo instituta AN SSSR

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(Scientific Station of the Physics Institute, AS USSR) and at Simenze (Krymskaya nauchnaya stantsiya FIAN (Crimean Scientific Station of the FIAN)). The first-mentioned station found values which were 8-10% below the normal ones, while Simenze found no deviations. The sharp increase of intensity was due to the increase of the number of primary particles with energies below $1.5.10^9$ ev. The increase of the number of primary particles of such low energies was accompanied by an intensity decrease in the case of primary particles of medium energies ($10^{10} > E > 1.5.10^9$ ev) and by an intensity increase in the case of primary particles with energies of more than 10^{10} ev. The authors finally thank S. N. Vernov for his interest in this investigation and for discussing results, and they also thank A. G. Bednyakov for his help in carrying out measurements. There are 2 figures and 2 Soviet references.

A Case of a Sharp Intensity Increase of Cosmic Radiation SOV/56-36-6-9/66
in the Stratosphere

ASSOCIATION: Fizicheskiy institut im. P. N. Lebedeva Akademii nauk SSSR
(Physics Institute imeni P. N. Lebedev of the Academy of
Sciences, USSR)

SUBMITTED: January 16, 1959

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CHARAKHCH'YAN, A.N.

PHASE I BOOK EXPLOITATION SOV/4413

International Cosmic Ray Conference. Moscow, 1959.

Proceedings. v. III. Moscow, 1960. 253 p. Errata slip inserted. No. of copies printed not given.

Sponsoring Agency: International Union of Pure and Applied Physics. Cosmic Ray Commission.

Ed.: S. I. Syrovatskiy, Editorial Board: G. B. Zhdanov (Ed.-in-Chief), I. P. Ivanenko (Assistant Ed.-in-Chief), N. M. Gerasimova, A. I. Nikishov, V. I. Zatsepin, B. A. Khrenov, L. I. Dorman, V. F. Tulinov, S. I. Syrovatskiy, V. M. Fedorov, Yu. N. Vavilov, and A. T. Abrosimov.

PURPOSE: This book is intended for physicists, astronomers and other scientists concerned with the earth's radiation belts and cosmic ray research.

COVERAGE: This is Volume 3 of a 4-volume work containing the proceedings of the Moscow Cosmic Ray Conference held July 6-11, 1959. This volume contains 80 reports on the earth's radiation belts and primary cosmic radiation. The reports delivered by Soviet scientists are abstracted below. References accompany individual reports.

9. Krassovsky (Krasovskiy), V.I., I.S. Shklovsky (Shklovskiy), G. I. Galperin, and E.M. Svetlitsky (Svetlitskiy). On Fast Corpuscles of the Upper Atmosphere 59-65
This paper presents experimental data on fast corpuscles of the upper atmosphere and gives a detailed description of the equipment used in the experiment.

11. Dorman, L.I. On the Problem of the Nature of Soft Radiation in the Upper Atmosphere 74-80
This paper summarizes the available data on bursts of soft radiation in the atmosphere and investigates the nature of the bursts in relation to processes on the sun, in corpuscular streams, and in the interplanetary medium. It also investigates the nature of these bursts in relation to the properties of the Earth's belts of radiation.

12. Askar'yan G. A. On the Nature of the External Radiation Belt of the Earth 81-82
It is stated that the external radiation belt encircling the earth is of nuclear origin, but that the explanations of the capture and accumulation of particles by the Earth's magnetic field in the course of its local variations are not convincing as an explanation of the nature of the external radiation belt. A more convincing explanation of the observed effects is given in this paper.

II. PRIMARY COSMIC RADIATION

22. Charakhch'yan, A.N., and T.N. Charakhch'yan (Lebedev Physical Institute, USSR Academy of Sciences; Nuclear Physics Research Institute, Moscow University). Energy Spectrum of Primary Cosmic Particles 129-135
This paper explains the results obtained from investigations of the electron component of cosmic radiation in the upper layers of the atmosphere.

23. Kocharyan, N.M., G.S. Saakyan, and Z.A. Kiracosyan (Kirakosyan). Spectrum of Cosmic Radiation Protons 136
This is an abstract of the results obtained in four independent experiments. The full text has been published in Russian in the Zhurnal eksperimental'noy i teoreticheskoy fiziki, 35, 1335 (1958).

(11)

83710

S/056/60/038/004/003/048
B019/B070

3.1800 (1041, 1062, 1168)

AUTHORS: Charakhch'yan, A. N., Tulinov, V. F., Charakhch'yan, T. N.

TITLE: A Case of Strong Perturbation in the Intensities of Cosmic Radiation in the Stratosphere

PERIODICAL: Zhurnal eksperimental'noy i teoreticheskoy fiziki, 1960, Vol. 38, No. 4, pp. 1031-1036

TEXT: The authors report on a strong perturbation of the cosmic radiation recorded between May 11, and 15, 1959. The intensity increased to about twenty times the normal value on May 12, at very high altitudes in the geomagnetic latitude 64°. The discharges in a counter, and the number of coincidences in a telescope with two counters were measured. The counters were sent to high altitudes in sounding balloons. The evaluation of the data (starting of the instrument on May 11 at 10 hours 10 minutes) at Loparskaya station showed that the cosmic radiation at high altitudes was stronger than the normal value. Another balloon was launched on the same day at 13 hours. Two other balloons followed on May 12. Measurements were also made from May 13 to 17. It is seen from Fig. 1, which graphically

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A Case of Strong Perturbation in the Intensities of Cosmic Radiation in the Stratosphere

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represents the measured data, that the intensity was higher than the normal up to May 15. This increase in the intensity was observed also at the sea level and was accompanied by magnetic storms. From the fact that no increase in the intensity was observed in the latitudes 41 and 51°, the authors infer that the additional particles observed at the high altitudes in the latitude of 64° during these days could not have been photons. The authors discuss in detail the nature and the spectrum of the primary particles, and refer also to similar phenomena observed on July 8, 1958. They come to the conclusion that the primary particles must have been protons, and in support of it they quote American results. The general discussion of the results is given in great detail. It is mentioned that the first observations of the increase of the intensity were recorded 11 hours after an explosion in the sun's chromosphere. Further, the effect of the earth's magnetic field on the cosmic particles is discussed. The authors finally come to the conclusion that the sources of these protons are corpuscular currents with frozen-in magnetic field which were emitted by the strong eruption of the sun on May 10, 1959. The authors thank I. K. Marshanov and Yu. N. Komarov for carrying out the measurements. There are 4 figures and 8 references: 6 Soviet and 1 US.

83710

A Case of Strong Perturbation in the Intensities of Cosmic Radiation in the Stratosphere

S/056/60/038/004/003/048
B019/B070

ASSOCIATION: Fizicheskiy institut im. P. N. Lebedeva Akademii nauk SSSR (Physics Institute imeni P. N. Lebedev of the Academy of Sciences, USSR). Institut yadernoy fiziki Moskovskogo gosudarstvennogo universiteta (Institute of Nuclear Physics of Moscow State University)

SUBMITTED: August 25, 1959

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83168
S/056/60/039/002/005/044
B006/B056

3.1800

AUTHORS: Charakhch'yan, A. N., Tulinov, V. F., Charakhch'yan, T. N.

TITLE: Cosmic Rays From the Sun

PERIODICAL: Zhurnal eksperimental'noy i teoreticheskoy fiziki, 1960, Vol. 39, No. 2 (8), pp. 249-256

TEXT: From July 9 to 21, 1959 intense cosmic-ray flares in the stratosphere were recorded in a geomagnetic latitude of 64°. These phenomena were preceded by eruptions in the solar chromosphere having an intensity of 3+ (on July 8, 10, 14, and 16). Similar observations had been made in July, 1958 and May, 1959. Measurements were carried out by means of radiosondes in the stratosphere. Fig. 1 shows the number of discharges recorded on different days (in a Geiger-Müller counter) as a function of air pressure. Fig. 2 shows the number of particles ΔN above standard as a function of air pressure, Fig. 3 shows the number ΔN of double coincidences as a function of air pressure, and Fig. 4 shows the integral energy spectrum of the primary protons. The Institut zemnogo

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Cosmic Rays From the Sun

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magnetizma, ionosfery i rasprostraneniya radiovoln AN SSSR (Institute of Terrestrial Magnetism, Ionosphere, and Propagation of Radiowaves of the AS USSR) placed data on solar chromosphere bursts and magnetic storms at the authors' disposal. They are compared in a diagram (Fig. 5) with the data of cosmic-ray intensity peaks. Fig. 6, finally, shows the amplitudes of cosmic-ray flares (according to measurements carried out in the stratosphere and on sea level) as functions of time (for a period of 100 hours). The following summary is given: 1. The considerable intensity increase of cosmic radiation (bursts) observed in northern latitudes were due to primary protons of solar origin. The energy of these protons was higher than 100 - 120 Mev. From the slope of the straight line in Fig. 4, the index of the integral energy spectrum was determined as being 5.0 - 5.5, as for other flares 6.0 was obtained. The energy spectra of the primary protons of different bursts deviate somewhat from one another. 2. All five cases of observed cosmic-ray intensity peaks were preceded by chromospheric flares on the Sun. 3. Cosmic radiation occurred after a delay of more than 4 to 5 hours and less than 10 to 15 hours. These long periods are not in accordance with the velocities of the primary protons.

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Cosmic Rays From the Sun

4. There is a correlation between the cosmic-ray bursts recorded and the magnetic storms beginning suddenly and a Forbush-type decrease of cosmic-ray intensity on the Earth. 5. The magnetic storms have little effect upon the intensity of the primary protons in the flares. A direct correlation could be determined between the amplitudes of the intensity increase of cosmic-ray bursts in the stratosphere at 64° north latitude and the amplitudes of the intensity drop of cosmic radiation in the stratosphere in more southern latitudes (51 and 41°). 6. The cosmic-ray bursts observed had a duration of the order of hours. In order to explain the results obtained in their totality, it is assumed that solar corpuscular beams function as the source of the primary protons of the bursts, which have frozen magnetic fields. The latter act as traps in which the protons are kept. The authors finally thank S. N. Vernov, Corresponding Member of the AS USSR, for discussions. There are 6 figures, 1 table, and 5 references: 3 Soviet and 2 US.

ASSOCIATION: Fizicheskiy institut im. P. N. Lebedeva Akademii nauk SSSR (Institute of Physics imeni P. N. Lebedev of the Academy

Cosmic Rays From the Sun

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B006/B056

of Sciences USSR)

SUBMITTED: February 26, 1959

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CHARAKHCH'YAN, A.N.

2

S/053/60/072/001/005/005
B013/B060

AUTHORS: Dobrotin, N. A., Grigorov, N. L., Zatsepin, G. T., Ivanenko, I. P., Charakhch'yan, A. N., Chudakov, A. Ye.

TITLE: Sergey Nikolayevich Vernov (On His 50th Birthday)

PERIODICAL: Uspekhi fizicheskikh nauk, 1960, Vol. 72, No. 1, pp. 153 - 155

TEXT: Sergey Nikolayevich Vernov celebrated his 50th birthday on July 10, 1960. The beginning of his scientific activity coincided with the beginning of an intensive research on cosmic rays (1931-1932). By his first studies he built the foundation for the present-day methods of investigating cosmic rays inside and outside of the stratosphere by means of radio signals emitted by automatic devices. From the start, Vernov worked in close contact with Academician D. V. Skobel'tsyn. In 1939, he completed a series of studies on cosmic rays in the stratosphere, measured at various latitudes. Stratospheric measurements made by Vernov from 1946 to 1949 yielded particularly detailed information on the nature of primary radiation. Basing on rules found by experiments

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to govern the absorption of the primary components in the atmosphere, Vernov reached an important conclusion concerning a strong interaction of the primary particles of cosmic radiation with matter. In 1949, S. N. Vernov headed an expedition of Soviet physicists to the equatorial latitudes in the Indian Ocean. Stratospheric investigations made in the course of that expedition yielded convincing evidence of the existence of the disputed, so-called east-west asymmetry and of the positive charge of particles of cosmic radiation. For his research of cosmic radiation in the stratosphere, Vernov was distinguished with the Stalin Prize of 1st Class in 1949. From 1947 to 1949, Vernov organized comprehensive studies of the interaction of high-energy protons with matter in the stratosphere. Collisions of protons with atomic nuclei were found to give rise to an electron-photon component of cosmic radiation. This allowed the assumption that rapidly decaying mesons giving rise to the formation of photons and electrons are produced in the course of such processes. This hypothesis was confirmed by the discovery of π^0-mesons. In 1949 and 1951, Vernov and collaborators obtained experimental data confirming the presence of nuclear cascade processes in 10^{10}-ev primary cosmic particles. Vernov supervised comprehensive research work on the

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interaction of cosmic rays with matter and obtained an insight into the mechanism of the formation of secondary cosmic rays in the atmosphere. It became thus possible to describe this process quantitatively. On Vernov's initiative, elementary processes of the interaction of 10^{11} - 10^{13} ev particles with atomic nuclei are being studied from a stratoplane. Under his supervision, a first-class laboratory was established at Moskovskiy gosudarstvennyy universitet (Moscow State University) to serve for research work on interaction of ultrahigh-energy particles (10^{14} - 10^{16} ev) with matter. The USSR network of stations for the permanent recording of cosmic rays was established with his participation, and is now operating under the IGY program. In acknowledgment of his scientific achievements, Vernov was elected Corresponding Member of the Akademiya nauk SSSR (Academy of Sciences USSR) in 1953. He was awarded the Lenin Prize in 1960 for his discovery and research of the outer radiation belt of the earth. S. N. Vernov is the head of the NIIYaF MGU (Scientific Research Institute of Nuclear Physics of Moscow State University), and runs the special section of the fizicheskiy fakul'tet MGU (Department of Physics at the MGU). There are 1 figure and 37 Soviet references.

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CHARAKHCHYAN, A.N., RYMKO, N.P., TULINOV, V.F., and CHARAKCHYAN, T.N.

"Secular Variations of Cosmic Ray Intensity in Stratosphere Measured Beginning from July, 1957,"

report presented at the Intl. Conference on Cosmic Rays and Earth Storms, Kyoto, Japan, 4-15 Sept 1961.

CHARAKHCHYAN, A.N., TULINOV, V.F. and CHARAKHCHYAN, T.N.

"Increase of Cosmic Ray Intensity in the Stratosphere in November, 1960."

report presented at the Intl. Conference on Cosmic Rays and Earth Storms, Kyoto, Japan, 4-15 Sept 1961.

37277

S/169/62/000/004/062/103
D228/D302

3,2100

AUTHOR: Charakhch'yan, A.N.

TITLE: Radio-sounding apparatus for measuring the cosmic radiation intensity in the stratosphere

PERIODICAL: Referativnyy zhurnal. Geofizika, no. 4, 1962, 3, abstract 4G18 (V sb. Kosmicheskiye luchi, no. 3, M., AN SSSR, 1961, 134-136)

TEXT: A description is given of the layout and the electronic systems of РК-2 (RK-2) type radio-sounding apparatus, intended for recording the cosmic ray intensity in the stratosphere. The recording is accomplished either by a single counter or by a telescope, consisting of two Г.-М. (G.-M.) meters. Count impulses are transmitted by means of a УКВ (UKV) transmitter to the earth and are recorded by a receiver, in whose outlet is inserted a recalculation system with a mechanical numerator. A barograph is used to determine the heights at which the cosmic ray recording is carried out. The weight of the instrument with a supply, guaranteeing normal operation under stratospheric conditions for 6 - 8 hrs., amounts to

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Radio-sounding apparatus for ... S/169/62/000/004/062/103
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about 2.2 kg. [Abstractor's note: Complete translation].

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S/169/62/000/005/074/093
D228/D307

AUTHORS: Charakhch'yan, A. N., Tulinov, V. F. and Charakhch'-yan, T. N.

TITLE: 27-day cosmic ray variations in the stratosphere in the period from July 1957 to February 1958

PERIODICAL: Referativnyy zhurnal, Geofizika, no. 5, 1962, 11, abstract 5G86 (V sb. Kosmich. luchi, no. 4, M., AN SSSR, 1961, 173-178)

TEXT: The authors investigate the 27-day periodicity of the change in the intensity of cosmic rays in the stratosphere during the periods 1/VII/1957 - 1/II/1958 and 1/II/1958 and 1/VII/1958. In the first period a 27-day intensity variation with an amplitude of $\sim 5.5 \div 0.6\%$ was observed in the stratosphere. The amplitude in the neutron component comprised 2.0% in latitude 53.5° on the earth's surface. No correlation was detected between the 27-day cosmic ray variations and the K-index of the geomagnetic activity. A 22-23 day periodicity is clearly displayed in the cosmic ray va-

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27-day cosmic ...

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D228/D307

riations and in the geomagnetic disturbances during the second period; the 27-day repetition is absent. The effect's amplitude in the stratosphere decreased by more than 5-fold. The intensity variations are compared with the solar activity. It is concluded that the corpuscular flows, modulating the intensity of cosmic rays, had a velocity of $\sim 10^7$ cm/sec. [Abstracter's note: Complete translation.]

Card 2/2

S/169/62/000/005/074/093
D228/D307

AUTHORS: Charakhch'yan, A. N., Tulinov, V. F. and Charakhch'-yan, T. N.

TITLE: 27-day cosmic ray variations in the stratosphere in the period from July 1957 to February 1958

PERIODICAL: Referativnyy zhurnal, Geofizika, no. 5, 1962, 11, abstract 5G86 (V sb. Kosmich. luchi, no. 4, M., AN SSSR, 1961, 173-178)

TEXT: The authors investigate the 27-day periodicity of the change in the intensity of cosmic rays in the stratosphere during the periods 1/VII/1957 - 1/II/1958 and 1/II/1958 and 1/VII/1958. In the first period a 27-day intensity variation with an amplitude of $\sim 5.5 \pm 0.6\%$ was observed in the stratosphere. The amplitude in the neutron component comprised 2.0% in latitude 53.5° on the earth's surface. No correlation was detected between the 27-day cosmic ray variations and the K-index of the geomagnetic activity. A 22-23 day periodicity is clearly displayed in the cosmic ray va-

Card 1/2

S/169/62/000/005/074/093
D228/D307

riations and in the geomagnetic disturbances during the second period; the 27-day repetition is absent. The effect's amplitude in the stratosphere decreased by more than 5-fold. The intensity variations are compared with the solar activity. It is concluded that the corpuscular flows, modulating the intensity of cosmic rays, had a velocity of $\sim 10^7$ cm/sec. [Abstracter's note: Complete translation.]

31592
S/169/61/000/010/035/053
D228/D304

17.1450

AUTHOR: Charakhch'yan, A. N., Tulinov, V. F., and Charakhch'yan, T. N.

TITLE: Some data on cosmic rays from the sun

PERIODICAL: Referativnyy zhurnal, Geofizika, no. 10, 1961, 9, abstract 10G51 (Geomagnetizm i aeronomiya, 1, no. 2, 1961, 150-152)

TEXT: Cases of large flares in the intensity of cosmic rays in the stratosphere, caused by protons with energies of 100 - 200 Me V , were recorded at the geomagnetic latitude 64°. Chromosphere flares on the sun--the source of protons with such energies--preceded these flares. The suggestion is expressed that these protons are transported by solar corpuscular flows with the magnetic fields frozen in them. It is estimated that the average flow of energy born by protons from the sun in flares comprises about 5% of the flow of energy born by all the primary

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Some data on...

particles of cosmic rays. Certain data are cited about the degree of irradiation in the interplanetary medium at the expense of the observed flares. [Abstracter's note: Complete translation.]

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CHARAKHCH'YAN, A.N.; TULINOV, V.F.; CHARAKHCH'YAN, T.N.

Intensity flares of cosmic rays in the stratosphere in November 1960. Geomag. i aer. 1 no.4:494-499 Jl-Ag '61. (MIRA 14:12)

1. Fizicheskiy institut imeni P.P. Lebedeva AN SSSR i Nauchno-issledovatel'skiy institut yadernoy fiziki Moskovskogo gosudarstvennogo universiteta.
(Cosmic rays)

25165
S/056/61/040/006/006/031
B102/B214

3.2410

AUTHORS: Charakhch'yan, A. N., Charakhch'yan, T. N.

TITLE: The energy spectrum and the total number of low energy photons in cosmic rays in the stratosphere

PERIODICAL: Zhurnal eksperimental'noy i teoreticheskoy fiziki v. 40, no. 6, 1961, 1602 - 1605

TEXT: It was the aim of the authors to check whether the assumption that the main source of low energy photons in the cosmic rays in the stratosphere is the bremsstrahlung of electrons is correct. It is shown by theoretical considerations and on the basis of experimental investigations that the assumption is not correct for the weakest part of the photon spectrum in the stratosphere. On account of the electromagnetic cascade multiplication the photon spectrum in the stratosphere is an equilibrium spectrum (a spectrum integrated over the depth) according to its form. It may also be assumed that the spectrum of such low energy photons is independent of the initial energy of the electron or the photon.

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The energy spectrum and the...

This assumption is experimentally found to be right. For such an equilibrium photon spectrum S. Z. Belen'kiy has given the integral equation

$$\int_E^\infty P(E')\,W_e(E'E)\,dE' - \sigma(E)\,\Gamma(E) + \int_E^\infty \Gamma(E')\,W_k(E'E)\,dE' = 0, \qquad (1)$$

where $\Gamma(E)$ is the desired photon distribution function, $P(E')$ the electron distribution function

$$\sigma(E) = \int_0^E [W_p(EE') + W_k(EE')]\,dE'$$

the total photon absorption cross section along an avalanche unit path in the shower; W_e, W_p, and W_k are the cross sections per unit path in the shower for electron bremsstrahlung, pair production by photons, and Compton scattering by photons, respectively. The expression for W_k is very complex. It was approximated to $W_k = 6/EE'$ by Belen'kiy and to $W_k = (6/EE')\left[1 + (E/E')^2\right]$ by P. S. Isayev. These approximations cannot

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The energy spectrum and the...

be for photons of less than 4 - 5 Mev. For them the exact expression of Klein-Nishina-Tamm must be referred to:

$$W_k(E'E) = \frac{g}{E'E}\left[1+\left(\frac{E}{E'}\right)^2 - \frac{2mc^2}{E'^2}(E'-E) + \frac{(mc^2)^2}{E'^2}\frac{(E-E')^2}{E}\right]. \qquad (2)$$

E' and E are the energies of the primary and the secondary photon in Mev, g = 1.32 Mev. The notation

$$\Gamma(E) = \frac{N(E)}{E}\,\frac{Z(E)}{\sigma(E)}$$

is introduced for simplicity and the function Z(E) is sought. One obtains Eq.

$$A - Z(E) + \frac{E}{N(E)}\int_E^{E_1}\frac{W_k(E'E)}{E'\sigma(E')}N(E')Z(E')\,dE' = 0. \qquad (4)$$

whose solution has the form $Z(E) = \sum_{n=0}^{\infty}\mu^n Z_n(E)$. The terms of this series are found to be

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The energy spectrum and the...

$$Z_0 = A, \quad Z_1 = \frac{E}{N(E)} \int_E^{E_1} \frac{W_k(E'E)}{E'\sigma(E')} N(E') Z_0(E')\, dE', \qquad (6)$$

$$Z_2 = \frac{E}{N(E)} \int_E^{E_1} \frac{W_k(E'E)}{E'\sigma(E')} N(E') Z_1(E')\, dE', \ldots$$

For sufficiently small E, A = 1.3. This determines the photon energy spectrum. The experimental investigations of the photon intensity were carried out by means of a scintillation counter (NaI (Tl) scintillator, and ФЭУ - 1C (FEU - 1S) photomultiplier) at a geomagnetic latitude of 51° and at an altitude of 33 - 35 km. It was found that the total flux of photons recorded exceeded the expected value almost by three times. For larger energies (> some Mev) the divergence is less. The divergence cannot be attributed to errors of measurement (which were 10 - 15%, the accuracy of the calculation being 10%). The fact that the experimental values agree with the maximal, and that the ratio of the total number of photons recorded to the total number of electrons is only slightly dependent on the altitude, show that the low energy photons in the

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The energy spectrum and the ...

stratosphere date from cascades. The authors thank I. P. Ivanenko for discussions. There are 1 figure and 4 Soviet-bloc references.

ASSOCIATION: Fizicheskiy institut im. P. N. Lebedeva Akademii nauk SSSR (Institute of Physics imeni P. N. Lebedev of the Academy of Sciences, USSR). Institut yadernoy fiziki Moskovskogo gosudarstvennogo universiteta (Institute of Nuclear Physics of Moscow State University)

SUBMITTED: January 4, 1961

Card 5/5

3.2410

28754
S/056/61/041/003/007/020
B125/B102

AUTHORS: Charakhch'yan, A. N., Tulinov, V. F., Charakhch'yan, T. N.

TITLE: Energy spectrum and time dependence of the intensity of protons of solar cosmic radiation

PERIODICAL: Zhurnal eksperimental'noy i teoreticheskoy fiziki, v. 41, no. 3(9), 1961, 735-746

TEXT: The authors report on stratospheric studies of the energy spectrum and the time dependence of the total proton intensity of solar cosmic radiation produced during the period of chromospheric eruptions. Measurements were made with radiosondes carried into the stratosphere by balloons. The number of discharges in a single counter and that of double coincidences in a telescope consisting of two Geiger-Müller counters were measured at various altitudes. The spectra of the various eruptions were similar, and did not essentially change throughout the eruptions (2-3 days). Primary protons are produced on the sun within a period much shorter than solar eruptions. The mechanism of proton production is the same in all eruptions. The integral energy spectrum of protons for E_p from 100 to

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B125/B102

Energy spectrum and time dependence...

400 Mev can be represented as an exponential function of their kinetic energy E_p with the exponent $\gamma = 2.0$. The energy spectrum of solar protons becomes softer during the Forbush decrease ($\gamma \approx 5.5$). This and the simultaneous hardening of the spectrum of galactic protons indicate that: Solar corpuscular currents carrying along frozen magnetic fields are carriers of protons of solar cosmic radiation. This phenomenon can only be explained by the existence of magnetic traps in solar corpuscular currents. In addition to protons, also other particles with ranges of less than 7 mm Al penetrate into the stratosphere during the Forbush decrease. The origin of these particles, which are only found during the Forbush decrease, is unknown. The time dependences of the intensity of primary protons in flares in the stratosphere agree satisfactorily with computations performed on the basis of the theory of proton diffusion in the interplanetary medium with magnetic clouds as scattering centers. There are 7 figures, 2 tables, and 21 references: 9 Soviet and 12 non-Soviet. The three most recent references to English-language publications read as follows: R. L. Arnoldy, R. A. Hoffman, J. R. Winkler, J. Geophys. Res., 65, 3004, 1960; C. J. Fan, P. Meyer, J. A. Simpson, Phys. Rev. Lett., 5, 269, 1960; J. C. Anderson, R. L. Chasson, M. P. Lifshitz, T. Suda. J.

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B125/B102

Energy spectrum and time dependence...

Geophys. Res., 65, 3889, 1960.

ASSOCIATION: Fizicheskiy institut im. P. N. Lebedeva Akademii nauk SSSR (Physics Institute imeni P. N. Lebedev of the Academy of Sciences USSR). Institut yadernoy fiziki Moskovskogo gosudarstvennogo universiteta (Institute of Nuclear Physics of Moscow State University)

SUBMITTED: April 27, 1961

Legend to Table 1: (1) Date of measurement; (2) time of measurement (world time); (τ) in hr, duration of measurement.

Card 3/4

CHARAKHCHYAN, A. N.; CHARAKHCHYAN, T. N.

"Cosmic Radiation Levels in the Stratosphere during the period from July 1957 to July 1962."

report presented at the 13th Gen Assembly, IUGG, Berkeley, Calif, 19-31 Aug 63.

42127

S/203/62/002/002/002/017
I046/1246

3.2410

AUTHORS: Charakhch'yan, A. N. and Charakhch'yan, T. N.

TITLE: New data on cosmic ray flares on the sun (reported at the International Conference on Cosmic Rays in Kioto, Japan, on September 4, 1961)

PERIODICAL: Geomagnetizm i aeronomiya, v. 2, no. 2, 1962, 233–237

TEXT: Measurements of proton absorption in 7 mm Al during the anomalously large cosmic ray flares in the stratosphere (results of proton acceleration in solar chromospheric flares) show that a) the energy spectra of solar protons are highly uniform in the absence of magnetic storms and Forbush decrease (F. d.), and b) the spectrum during F. d. is surprisingly rich in low-energy protons (the indices of the integral spectrum of solar protons are $\sim$ 2.0 and 5.5 before and during F. d. respectively). Result (b) shows that the solar protons being unaffected by magnetic storms, are ferried by the corpuscular streams, in magnetic traps. Assuming diffusion of protons in interplanetary space, the authors obtain the diffusivity $D = 5.5 \cdot 10^{21}$ cm^2/sec for $\sim$ 0.5 Bev protons which gives a free path of 10^{12} cm (about 1/10 of the Sun-Earth distance) before the protons scatter on $\geqq 1.5 \cdot 10^{-6}$ gauss magnetic clouds. During F. d., incursion of particles with $<$ 7 mm Al paths (presumably electrons) was also observed. There are 3 figures and 1 table.

ASSOCIATION: Fizicheskii institut im. P. N. Lebedeva AN SSSR (Physical Institute im. P. N. Lebedev AS USSR)

SUBMITTED: October 25, 1961

Card 1/1

CHARAKHCH'YAN, A.N.; CHARAKHCH'YAN, T.N.

Solar cosmic rays in May and June 1961. Geomag. i aer. 2 no.4:626-629 Jl-Ag '62. (MIRA 15:10)

1. Fizicheskiy institut imeni P.N.Lebedeva AN SSSR i Moskovskiy gosudarstvennyy universitet, Institut yadernoy fiziki.
(Solar radiation)

S/203/62/002/004/001/018
I046/I242

AUTHORS: Charakhch'yan, A.N. and Charakhch'yan, T.N.

TITLE: Solar cosmic rays in May and July 1961

PERIODICAL: Geomagnetizm i aeronomiya, v.2, no.4, 1962, 626-629

TEXT: The article reports on the maximum cosmic ray intensity in the stratosphere as measured at 64°N (Olen'ya), 51°N (Dolgoprudnyy), and 41°N (Simeize) between July 10 and 25, 1961. The authors also describe the flare of May 9, 1961. At 8:30, the cosmic ray intensity increased by a factor of 3; at 11:30, by a factor of 2; life time of the flare was ~10 hours. There are 3 figures.

ASSOCIATION: Fizicheskiy institut im. P.N.Lebedeva AN SSSR; Moskovskiy gosudarstvennyy universitet, Institut yadernoy fiziki (The Physical Institute im. P.N. Lebedev, AS USSR; Moscow State University, Institute of Nuclear Physics)

SUBMITTED: April 4, 1962

Card 1/1

CHARAKHCH'YAN, A.N.; CHARAKHCH'YAN, T.N.

Flares of cosmic ray intensity in the stratosphere and chromospheric flares of the sun. Geomag. i aer. 2 no.5:829-835 S-O '62. (MIRA 15:10)

1. Fizicheskiy institut im. P.N. Lebedeva.
(Solar radiation)

CHARAKHCHYAN, A. N.; CHARAKHCHYAN, T. N.

"Cosmic Ray Flares at the Sun."

report presented at the 13th Gen Assembly, IUGG, Berkeley, Calif. 19-31 Aug 63.

CHARAKHCHYAN, A.N. 6

VAKULOV, P.V., VERNOV, S.N., GORCHAKOV, YE.V., LOGACHEV, YU.I.
CHARAKHCHYAN, A.N., CHARAKHCHYAN, T.N., CHUDAKOV, A. YE.

Cosmic rays in the stratosphere and their correlation with solar activity.

Report to be submitted for Space Research Committee on COSPAR 6th plenary meeting
Warsaw, Poland 11 June 63-

L 19728-63 EWT(1)/BDS/EEC-2/ES(v) AFFTC/ASD/AFMDC/ESD-3/APGC Pi-4/
~~Po-4/Pe-4/Pq-4 PT-2/GW~~
ACCESSION NR: AP3004005 S/0203/63/003/004/0604/0607

112
82

AUTHORS: Charakhch'yan, A. N.; Charakhch'yan, T. N.

TITLE: Secular variation of cosmic ray intensity in stratosphere

SOURCE: Geomagnetizm i aeronomiya, v. 3, no. 4, 1963, 604-607

TOPIC TAGS: cosmic ray, stratosphere, solar activity, sunspot

ABSTRACT: The results of systematic cosmic ray intensity measurements in the stratosphere at latitudes 64, 51, and 41° N are reported. An attempt is made to obtain information on intensity fluctuations of primary cosmic rays with energies 0.1, 1.3, and 4.0 Bev(for protons). It is found that the secular variations in cosmic ray intensity during the period between maximum and minimum solar activity exhibits a discontinuous or an abrupt nature. Sharpest variation of intensity was observed during periods January-February and October-December of 1961. It is shown that the general pattern of intensity variations correlates well with solar activity, characterized by the relative number of sunspots. "The authors express their gratitude to S. N. Vernov, N. A. Dobrotin, and M. G. Krivonosov."

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L 19728-63

ACCESSION NR: AP3004005

20

Also acknowledged are the members who gathered the data: F. Kh. Mochakov, I. K. Marshanov, V. V. Bayarevich, P. N. Ageshin, A. E. Golenkov, V. N. Sokolov, V. S. Malofeyev, A. F. Krasotkin, V. N. Makunin, I. N. Suvorov, K. R. Nikitin, Yu. S. Zhukov, A. I. Istratova, G. V. Tyurenkova, G. V. Yastrebtseva, K. A. Bogatskaya, Z. A. Ovchininkova, A. F. Biryukova, T. P. Komarova. Orig. art. has: 3 figures.

ASSOCIATION: Fizicheskiy institut im. P. N. Lebedeva AN SSR, Moskovskiy gosudarstvennyy universitet institut yadernoy fiziki (Institute of Physics, Academy of Sciences, SSSR; Moscow State University, Institute of Nuclear Physics)

SUBMITTED: 04Jan63 DATE ACQ: 15Aug63 ENCL: 00

SUB CODE: AS NO REF SOV: 004 OTHER: 000

Card 2/2

BAZILEVSKAYA, G.A.; KRASOTKIN, A.F.; CHARAKHCH'YAN, A.N.

X-ray photons in extensive air showers at various mean free paths for r clear interaction. Izv. AN SSSR. Ser. fiz. 28 no.11:1899-1903 N '64. (MIRA 17:12)

1. Fizicheskiy institut im. P.N. Lebedeva AN SSSR.

CHARAKHCH'YAN, A.N.; CHARAKHCH'YAN, T.N.

Some results of calculating the energy spectrum of galactic cosmic rays. Izv. AN SSSR Ser. fiz. 28 no.12:1926-1929 D '64 (MIRA 18:2)

Secular variation of cosmic rays in the stratosphere and the energy spectrum of cosmic rays. Ibid.:1959-1962

Forbush decrease of cosmic ray intensity according to stratospheric data. Ibid.:1963-1965

L 23403-65 EWT(1)/EWG(v)/FCC/EEC-4/EEC(t)/EWA(h) Po-4/Pe-5/Pq-4/Pae-2/Peb/
P1-4 GW/WS

ACCESSION NR: AP5002097 S/0048/64/028/012/1959/1962

AUTHOR: Charakhch'yan, A. N.; Charakhch'yan, T. N.

TITLE: Secular rate of the intensity of cosmic rays in the stratosphere and the energy spectrum of primary cosmic rays

SOURCE: AN SSSR. Izvestiya. Seriya fizicheskaya, v. 28, no. 12, 1964, 1959-1962

TOPIC TAGS: cosmic ray, cosmic ray intensity, intensity fluctuation, geomagnetic storm, Forbush effect, stratosphere, geomagnetic latitude, solar activity cycle, Wolf number, primary cosmic ray

ABSTRACT: Cosmic ray intensity has been studied for geomagnetic latitudes of 64°, 51°, and 41°. Processed data are represented by graphs which show irregular fluctuations in cosmic ray intensity. A good correlation between irregularities is demonstrated at 51° and 64° lat. Some fluctuations are caused by geomagnetic storms followed by Forbush effects in the stratosphere. An increase in cosmic ray intensity is associated with higher geomagnetic latitudes and with

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L 23403-65
ACCESSION NR: AP5002097

time. There is a correlation between the secular rate of cosmic ray variations and the 11-year cycle of solar activity (Wolf number). The particle number in the stratosphere at several points on the earth is the basis of the study of the energy spectrum of particles of primary cosmic rays in relation to the solar activity cycle. The results are represented graphically in the original article, and the curves show a uniform change in the particle number during the solar activity cycle. Orig. art. has: 3 figures and 1 table.

[EG]

ASSOCIATION: none

SUBMITTED: 00 ENCL: 00 SUB CODE: AA

NO REF SOV: 004 OTHER: 000 ATD PRESS: 3174

Card 2/2

L 23404-65 EWT(1)/EWG(v)/FCC/EEC-4/EEC(t)/EWA(h) Po-4/Pe-5/Pq-4/Pae-2/Peb/Pi-4
ACCESSION NR: AP5002098 GW/WS S/0048/64/028/012/1963/1965

AUTHOR: Charakhch'yan, A. N.; Charakhch'yan, T. N. B

TITLE: Forbush decreases in the intensity of cosmic rays according to data obtained in the stratosphere

SOURCE: AN SSSR. Izvestiya. Seriya fizicheskaya, v. 28, no. 12, 1964, 1963-1965

TOPIC TAGS: cosmic ray intensity, stratosphere, magnetic storm, geomagnetic latitude, primary cosmic ray

ABSTRACT: Thirty-five cases of decreases in the intensity of cosmic rays in the stratosphere which were followed by magnetic storms have been recorded at geomagnetic latitudes of 51° and 41°. Data obtained in the stratosphere at 41° lat agreed with those obtained on the ground. Variations in the particle number obtained on the earth's surface correspond to the variations of primary cosmic rays, the energy of which is between 1.5 Bev and 4.6 Bev. A table is given in the original article which contains the ratios of intensities of primary cosmic rays measured on the ground to those measured in the

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ACCESSION NR: AP5002098

stratosphere at 51° and 41° lat and also ratios of variations of primary cosmic rays in the stratosphere at 51° lat to those measured on the ground. The numerical values given in the table do not vary from storm to storm. Orig. art. has: 1 figure, 1 table, and 1 formula.
[EG]

ASSOCIATION: none

SUBMITTED: 00	ENCL: 00	SUB CODE: AA
NO REF SOV: 006	OTHER: 000	ATD PRESS: 3174

Card 2/2

ACCESSION NR: AP4037565 S/0056/64/046/005/1556/1560

AUTHORS: Bazilevskaya, G. A.; Krasotkin, A. F.; Charakhch'yan, A. N.

TITLE: Energy spectrum and total number of x-ray photons in extensive air showers of cosmic rays

SOURCE: Zh. eksper. i teor. fiz., v. 46, no. 5, 1964, 1556-1560

TOPIC TAGS: cosmic ray, extensive air shower, x-ray photon equilibrium spectrum, electron photon cascade

ABSTRACT: In view of the discrepancy between the previously calculated equilibrium spectrum of low-energy (x-ray) photons produced in electron-photon cascades generated by primary electrons or photons of relatively high energy (ZhETF v. 40, 1602, 1961) and the experimental data with scintillation counters on pilot balloons, the experiments on the low-energy photons have been repeated in extensive air showers, in which the overwhelming majority of particles are

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ACCESSION NR: AP4037565

electrons and photons, and concerning which there are still few data in the literature. The measured energy spectrum and the total number of x-ray photons in the EAS were found to be in agreement with the calculations for the equilibrium spectrum of photons produced in electron-photon cascades. The measurements were made by two methods; by recording the number of triple coincidences in scintillation counters and by recording quadruple coincidences for three gas-discharge and a single scintillation counter. The disparity with the data obtained in the measurements with the aid of triple coincidences is explained. Orig. art. has: 3 figures and 5 formulas.

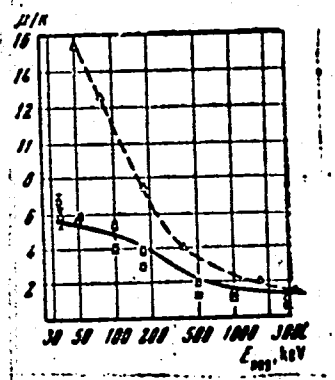
ASSOCIATION: Fizicheskiy institut im. P. N. Lebedeva AN SSSR (Physics Institute, AN SSSR)

SUBMITTED: 11Oct63 DATE ACQ: 09Jun64 ENCL: 01

SUB CODE: GP, NP NR REF SOV: 002 OTHER: 003

ACCESSION NR: AP4037565

ENCLOSURE: 01



Ratio of number of flashes due to photons in the scintillator, to the number of flashes produced by the electrons, as a function of the energy-release threshold E_{thr}: Δ- measurements in the stratosphere. The EAS measurement data are as follows:
○ - with the aid of three scintillation counters,
□ - with the aid of three gas-discharge and one scintillation counter; continuous line - results of calculations.

Abscissa - E_{thr}, keV; ordinate - number of flashes in counter.

Card 3/3

ACCESSION NR: AP4038549 S/0053/64/083/001/0035/0062

AUTHOR: Charakhch'yan, A. N.

TITLE: Investigation of stratosphere cosmic ray intensity fluctuations induced by processes on the sun

SOURCE: Uspekhi fizicheskikh nauk, v. 83, no. 1, 1964, 35-62

TOPIC TAGS: cosmic ray measurement, cosmic ray burst, solar flare, solar activity, solar magnetic field, interstellar matter, solar corpuscular radiation

ABSTRACT: The data reported are based on more than 4000 measurements carried out in the stratosphere, predominantly with cosmic-ray radiosondes. Among the major practical purposes of the research is to predict the intensity of cosmic-ray flares and to ascertain the radiation danger it presents to astronauts. Cyclic (27-day) variations, Forbush decreases, and secular variations of cosmic-ray inten-

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ACCESSION NR: AP4038549

sity were also investigated. It is pointed out in the conclusions that the main cosmic-ray intensity fluctuations in the stratosphere are due to processes occurring on the sun. Cosmic ray flares in the stratosphere correlate with chromospheric flares and with many geophysical phenomena such as absorption of galactic radio emission in polar-cap regions and geomagnetic storms. While the energy spectra of the cosmic-ray protons produced on the sun remain practically constant in time, the existence of two distinct energy spectra with different exponents offers evidence that the corpuscular streams of the solar chromospheric flares contain unique magnetic traps for the fast protons generated on the sun. The time variation of the intensity of the protons in the stratosphere correlates well with the notion that the cosmic-ray protons propagate diffusely from the sun in a medium with magnetic inhomogeneities. The diffusion coefficient is proportional to the square root of the proton momentum. The fact that the cosmic rays generated in flares on the visible side of the sun have almost double the intensity than on the opposite side of

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ACCESSION NR: AP4038549

the sun indicates that the sun has a radial magnetic field estimated at 10^6 Gauss. The section headings are: I. Cosmic ray flares. 1. Radiosonde for cosmic rays (RK). 2. Cosmic ray flares in the stratosphere and phenomena that correlate with them. 3. Investigation of the energy spectrum of protons in flares. 4. Interpretation of the effect of softening of the energy spectrum during the time of the Forbush decrease. 5. Generation of low- and high-energy solar cosmic rays. 6. Penetration of short-range electrons into the stratosphere during the Forbush decrease. 7. Intensity of the primary protons as a function of the time. 8. Diffusion of solar cosmic-ray protons into interplanetary space. Data on the diffusion coefficient. Field intensity in the magnetic inhomogeneities. 9. Cosmic-ray flares generated on the opposite side of the solar disc., Radial magnetic fields of the sun. II. 27-day variations of cosmic rays in the stratosphere. III. Decrease in stratosphere cosmic-ray intensity during geomagnetic storms. 1. Measurement results. 2.

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Discussion of the results. IV. Secular variations of cosmic-ray intensity. 1. Secular variations of the particle-number difference. 2. Correlation with solar activity. 3. Character of variation of the energy spectra of the primary particles with the solar-activity cycle. Conclusion. Orig. art. has: 14 figures, 3 formulas, and 5 tables.

ASSOCIATION: None

SUBMITTED: 00 DATE ACQ: 09Jun64 ENCL: 00

SUB CODE: AA NR REF SOV: 035 OTHER: 013

Card 4/4

L 48310-65 EWG(j)/FSS-2/EWT(l)/EWT(m)/EWG(v)/FCC/EEC-4/EEC(t)/T/EWA(h) Pi-4/
Pc-4/Pc-5/Pq-4/Pae-2/Peb IJP(c) GW-2
ACCESSION NR: AP5010265 UR/0203/65/005/002/0220/0225

AUTHOR: Charakhch'yan, A. N.; Charakhch'yan, T. N.

TITLE: On the energy spectrum of protons and α-particles in cosmic rays of solar flares

SOURCE: Geomagnetizm i aeronomiya, v. 5, no. 2, 1965, 220-225

TOPIC TAGS: differential energy spectrum, primary solar proton, stratosphere, cosmic ray, proton spectrum, solar wind, nuclear photoemulsion, alpha particle

ABSTRACT: The differential energy spectrum of primary solar protons with energies of 100—170 Mev has the exponent $\gamma \sim 6$. A comparison of data obtained on the ground with those obtained in the stratosphere during a low-energy flare showed that the exponent could be about 3. Further measurements indicated that cosmic rays with energies of hundreds of Mev may be associated with a spectral exponent $\gamma \sim 3.0$ if they are measured in the stratosphere. The same cosmic rays measured on the ground may be associated with the exponent $\gamma \sim 6$. This proton spectrum is connected with a supplementary proton flow carried by the magnetic field and captured from the solar wind in interplanetary space. The spectra of cosmic rays with energies of hundreds of Mev generated in various flares coincide with one another. Energy spectra of

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L 48310-65

ACCESSION NR: AP5010265

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solar α-particles and nuclei are obtained by nuclear photoemulsions carried by balloons and rockets. Measurements in the stratosphere yielded α-particle energies of 320—800 Mev, and measurements taken at great heights by means of rockets yielded 120—480 Mev. Spectra from both types of measurements are represented graphically. Both graphs show a similarity of curves. Orig. art. has: 3 figures, 2 formulas, and 4 tables. [EG]

ASSOCIATION: Fizicheskiy institut im. P. N. Lebedeva AN SSSR (Institute of Physics, AN SSSR); Institut yadernoy fiziki, Moskovskiy gosudarstvennyy universitet (Institute of Nuclear Physics, Moscow State University)

SUBMITTED: 27July64 ENCL: 00 SUB CODE: AA

NO REF SOV: 008 OTHER: 008 ATD PRESS: 3252

Card 2/2

L 48311-65 EWG(j)/EWT(l)/EWT(m)/EWG(v)/ECC/EEC-4/EEC(t)/T/EWA(h) Pc-4/
Pc-5/Pq-4/Pae-2/Peb/Pi-4 IJP(c) GW
ACCESSION NR: AP5010266 UR/0203/65/005/002/0226/0229

AUTHOR: Charakhch'yan, A. N.; Charakhch'yan, T. N.

TITLE: On the diffusion coefficient of solar cosmic ray protons in the interplanetary medium

SOURCE: Geomagnetizm i aeronomiya, v. 5, no. 2, 1965, 226-229

TOPIC TAGS: chromospheric flare, flare emission, interplanetary medium, cosmic ray, corpuscular stream, stratosphere, magnetic shell

ABSTRACT: Two types of dependence in time of flare emissions on the electromagnetic state of the interplanetary medium are discussed. The first type includes cosmic rays which are generated on the western side of the solar disk and propagate freely in space between the Sun and the Earth, independently of other chromospheric flares. The second type consists of temporary radiation from the flare with particles that penetrate into the regular stream of a previous chromospheric flare. Four cases of flares related to the first type are discussed. The propagation of cosmic rays occurred freely without corpuscular streams in space. The results obtained were represented graphically. Graphs of observation data obtained on the ground resemble the curve obtained in the stratosphere. Three cases of flares of the second type

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ACCESSION NR: AP5010266

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are discussed. In one case, cosmic rays generated in an active solar region reached the earth when the latter was surrounded by the corpuscular stream of a previous flare. The motion of solar cosmic rays is considered as motion within a magnetic shell of corpuscles ejected during a previous flare. Similar processes took place in other cases. Orig. art. has: 2 figures and 2 formulas. [EG]

ASSOCIATION: Fizicheskiy institut im. P. N. Lebedeva AN SSSR (Institute of Physics, AN SSSR); Institut yadernoy fiziki, Moskovskiy gosudarstvennyy universitet (Institute of Nuclear Physics, Moscow State University)

SUBMITTED: 27Jul64 ENCL: 00 SUB CODE: AA

NO REF SOV: 004 OTHER: 005 ATD PRESS: 3252

Card 2/2

CHARAKHCH'YAN, A.N.; CHARAKHCH'YAN, T.N.

Energy spectrum of protons and alpha particles form solar bursts of cosmic rays. Geomag. i aer. 5 no.2:220-225 Mr-Ap '65.

Coefficient of diffusion of protons in solar cosmic rays in the interplanetary space. Ibid.:226-229 (MIRA 18:7)

L 19364-66 EWT(1)/FCC/EWA(h) GW

ACCESSION NR: AP5021005 UR/0203/65/005/004/0757/0759
523.165:523.877

AUTHORS: Charakhch'yan, A. N.; Golenkov, A. Ye.; Charakhch'yan, T. N. 14

TITLE: Irruptions in the stratosphere of particles of the Van Allen belt 12 12 B

SOURCE: Geomagnetizm i aeronomiya, v. 5, no. 4, 1965, 757-759

TOPIC TAGS: stratosphere, ionosphere, Van Allen belt, flare, radio emission, bremsstrahlung

ABSTRACT: Several extraordinary surges in total ionized radiation in the stratosphere were recorded between January and April 1964 over Murmansk. These were not recorded at Antarctic stations, however. It seems most likely that the excessive radiation in the stratosphere was due to the Van Allen belt. Because of greater excitation, particles originating in the belt penetrated into the upper atmosphere and reached heights of about 15 km. Measurements on four different days are described in the text. A comparison of the measurements with geophysical phenomena shows that the occasions of excessive radiation in the stratosphere correlate with the K indices of geomagnetic activity with high ionospheric disturbances. For the auroral zones they correlate with the

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L 19364-66

ACCESSION NR: AP5021005

2

absorption of radio waves in the F2 layer of the ionosphere. No chromospheric flares or radio emission bursts were recorded for the sun during the investigated period. It is calculated that electrons penetrating the Van Allen belt are absorbed in the upper atmosphere, chiefly at pressures of < 1 g/cm^2, and they yield bremsstrahlung photons, the penetrating capacity of which, depending on energy, is tens and hundreds of times that of the electrons. As a first approximation, primary radiation is due to photons forming in the upper atmosphere, and the effective energy of the photons may be found from experimental curves showing the radiation absorption in the stratosphere. Data for six measurements are tabulated. Orig. art. has: 1 figure and 2 tables.

ASSOCIATION: Fizicheskiy institut im. P. N. Lebedeva, AN SSSR (Physical Institute, AN SSSR); Moskovskiy gosudarstvennyy universitet, Institut yadernoy fiziki (Moscow State University, Institute of Nuclear Physics)

SUBMITTED: 24Aug64 ENCL: 00 SUB CODE: ES, AA

NO REF SOV: 002 OTHER: 000

Card 2/2 BG

L 15778-66 EWT(1)/FCC/EWA(h) GW

ACC NR: AP6006666 SOURCE CODE: UR/0203/66/006/001/0126/0128

AUTHOR: Charakhch'yan, A. N.; Kvashnin, A. N.; Charakhch'yan, T. N.

ORG: Institute of Physics im. P. N. Lebedev, AN SSSR (Fizicheskiy institut AN SSSR); Moscow State University, Institute of Nuclear Physics (Moskovskiy gosudarstvennyy universitet, Institut yadernoy fiziki)

34
B

TITLE: Solar cosmic rays on 21 and 26 September 1963

SOURCE: Geomagnetizm i aeronomiya, v. 6, no. 1, 1966, 126-128

TOPIC TAGS: cosmic ray, stratosphere, chromospheric flare, interplanetary space, proton spectrum, magnetic heterogeneity, solar plasma, diffusion coefficient

ABSTRACT: On 21 and 26 September 1963, solar cosmic rays were simultaneously recorded at Oleniya in the Murmansk region and at Mirnyy in Antarctica. These rays were recorded in the stratosphere and were generated by a chromospheric flare of class 3+. Records at both stations coincided, confirming the isotropic scattering of solar cosmic rays in interplanetary space. Inclinations of integral proton spectra coincided for both the chromospheric flares of 21 and of 26 September. The exponential index of the integral spectrum was 3.6 for the energy range

Card 1/2 UDC: 523.165

L 15778-66
ACC NR: AP6006666

120—200 Mev. The isotropic motion of cosmic rays in the vicinity of the earth is caused by magnetic heterogeneities formed in interplanetary space by solar plasma with frozen magnetic fields. The density of plasma currents diminishes with the decrease of solar activity, which causes the increase in the diffusion coefficient of cosmic rays. An increase in the diffusion coefficient was found in the years 1961, 1962, and 1963 in comparison with the coefficient in 1960. A table in the original article contains the diffusion coefficient and the number of sunspot groups for 1960, 1961, 1962, and 1963. Orig. art. has: 4 figures and 1 table.

SUB CODE: 04/ SUBM DATE: 07Jun65/ ORIG REF: 005/ OTH REF: 003/ ATD PRESS: 4200

[EG]

Card 2/2

L 29923-66 EWT(1)/FCC

ACC NR: AP6018935 SOURCE CODE: UR/0203/66/006/003/0617/0618

AUTHOR: Ageshin, P. N.; Charakhch'yan, A. N.

ORG: Physics Institute im. P. N. Lebedev, AN SSSR (Fizicheskiy institut AN SSSR)

TITLE: Stratospheric probe for measuring cosmic rays

SOURCE: Geomagnetizm i aeronomiya, v. 6, no. 3, 1966, 617-618

TOPIC TAGS: atmospheric probe, cosmic ray measurement, radiation counter

ABSTRACT: An improved version of the RK-1 cosmic-ray probe is described. The original, which has been used successfully for several years, has been simplified to the schematic shown in Fig. 1. The changes are that the modulator (T_1) requires one rather than the former two tubes; also, T_1 in the new design is normally cut off except during a recording pulse, which gives a saving in average anode drain. Except for these changes, the probe design is the same. The STS-6 Geiger

Card 1/2

UDC: 523.165 : 681.2

L 29923-66

ACC NR: AP6018935

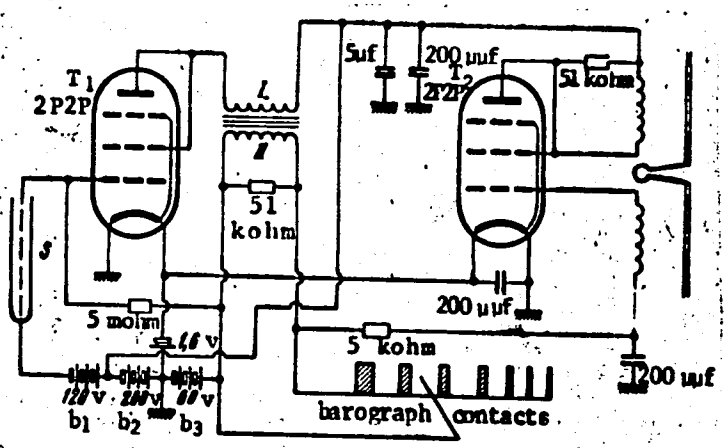

Fig. 1. Cosmic-ray counter

S - Geiger counter; T_1 - modulator; T_2 - transmitter.

counter is switched on at altitude intervals by the spaced barograph contacts, and operates for about 400-μsec intervals. Counter electrode voltage is 380 ±2v, transmission frequency is 70 mc, and total probe weight is about 1.7 kg. Orig. art. has: 1 figure. [SH]

SUB CODE: 04 SUBM DATE: 14Aug65/ ORIG REF: 001/ ATD PRESS: 5011

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L 07132-67 EWT(1)/ECC GW

ACC NR: AP7001044 SOURCE CODE: UR/0203/66/006/003/0586/0587

AUTHOR: Charakhch'yan, A. N.; Sokolov, V. N.; Charakhch'yan, T. N. 34 B

ORG: Physics Institute im. P. N. Lebedeva, AN SSSR (Fizicheskiy institut AN SSSR); Institute of Nuclear Physics, Moscow State University (Moskovskiy gosudarstvennyy universitet, Institut yadernoy fiziki)

TITLE: Interesting case of fluctuation of cosmic ray intensity in the stratosphere on 3 December 1964

SOURCE: Geomagnetizm i aeronomiya, v. 6, no. 3, 1966, 586-587

TOPIC TAGS: cosmic ray intensity, radiosonde, geomagnetic field

ABSTRACT: The intensity of stratospheric cosmic rays varies continuously and in most cases these changes occur in the range of several percent. The case described in this paper is said to be of particular interest. The data of one of three measurements of stratospheric cosmic rays on 3 December 1964 over Dolgoprudnyy were higher than ordinary. The data fell on the curve obtained for cosmic ray intensity at Olen'ya station near Murmansk. The magnetic rigidity cutoffs of primary cosmic rays for Dolgoprudnyy and Olen'ya are ~2.2 and 0.5 GeV respectively. The measurements were made using cosmic ray radiosondes. The possibility of instrument errors was excluded. On the basis of the character of the measured fluctuation it is

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L 07139-67

ACC NR: AP7001044

postulated that there was a decrease of the rigidity cutoff of cosmic rays over Dolgoprudnyy to ~0.5 BeV/sec. However, such a change would correspond to a very large and rather stable decrease of the geomagnetic field of about 0.1 oe, but this apparently did not occur. It therefore is necessary to find a more probable explanation of the described case. Orig. art. has: 1 figure. [JPRS: 36,794]

SUB CODE: 04, 08 / SUBM DATE: 14Aug65 / ORIG REF: 001

Card 2/2 YC

ACC NR: AP6033984 SOURCE CODE: UR/0203/66/006/003/0486/0493

AUTHOR: Charakhch'yan, A. N.; Charakhch'yan, T. N.

ORG: Physics Institute im. P. N. Lebedev, AN SSSR (Fizicheskiy institut AN SSSR); Institute of Nuclear Physics, Moscow State University (Institut yadernoy fiziki Moskovskogo Gosudarstvennogo Universiteta)

TITLE: Secular changes of cosmic ray intensity and the 11-year cycle of solar activity

SOURCE: Geomagnetizm i aeronomiya, v. 6, no. 3, 1966, 486-493

TOPIC TAGS: cosmic radiation, solar cycle, solar activity

ABSTRACT: A. N. Charakhch'yan and T. N. Charakhch'yan have analyzed data on the secular changes of cosmic ray intensity in the stratosphere in 1957-1964. The secular changes of intensity in interplanetary space are caused almost completely by the 11-year cycle of solar activity. The authors determined some spatial and temporal patterns of cosmic ray modulation in interplanetary space. The radius r of a sphere around the sun, within which the modulation of galactic cosmic rays occurs, is dependent on solar activity. The total intensity of galactic cosmic rays at the earth (p 0.5 BeV) in late 1964 attained almost 90-95% of the value corresponding to the intensity of cosmic rays outside the sphere of modulation. It is concluded that in the

Card 1/2 UDC: 523.165

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ACC NR: AP6033984

period of the minimum of solar activity there is no appreciable difference of the energy spectra of galactic cosmic rays at the earth and beyond the limits of the modulation region. The authors thank S. N. Vernov and N. A. Dobrotin for their interest in the experiments and their discussions of the results. Orig. art. has: 5 figures, 12 formulas, and 1 table. [JPRS: 37,058]

SUB CODE: 03 / SUBM DATE: 23Aug65 / ORIG REF: 007 / OTH REF: 007

Card 2/2

GOL'DBERG, O.D., kand.tekhn.nauk; SOROKER, T.G., doktor tekhn.nauk;
MHARAKHCH'YAN, I.N., inzh.

Concerning the reliability of asynchronous motors. Vest. elektroprom. 33 no.9:62-67 S '62. (MIRA 15:10)
(Electric motors, Induction)

CHARAKHCH'YAN, I.N., insh.; VOSKRESENSKIY, A.P., kand. tekhn. nauk

Effect of a method for casting and insulating a short-circuited cage from the rotor core on the indices of an asynchronous motor. Elektrotekhnika 35 no.1:38-41 Ja '64.
(MIRA 17:2)

CHARAKHCH'YAN, T. N.

USSR/Nuclear Physics - Cosmic Rays
Nuclear Physics - Counters, Electronic

Jul 47

"Study of the Transitional Effect of Cosmic Rays in the Stratosphere With Counters," S. I. Brikker, S. N. Vernov, I. M. Yevreinova, S. P. Soholov, T. N. Charakch'yan, Phys Inst imeni P. N. Lebedev, Acad Sci USSR, and Moscow State U imeni M. V. Lomonosov, 4 pp

"Dok Akad Nauk SSSR, Nova Ser" Vol LVII, No 2

Counters used to measure transitional effect at altitudes of 10-26 km. Accomplished by pibal equipment. Impulses of particles, piercing lead cover of the apparatus, picked up by radio receivers on ground, then channelled through counters. Submitted by Academician S. I. Vavilov, 12 May 1947.

PA 60778

CHARAKHCH'YAN, T. N.

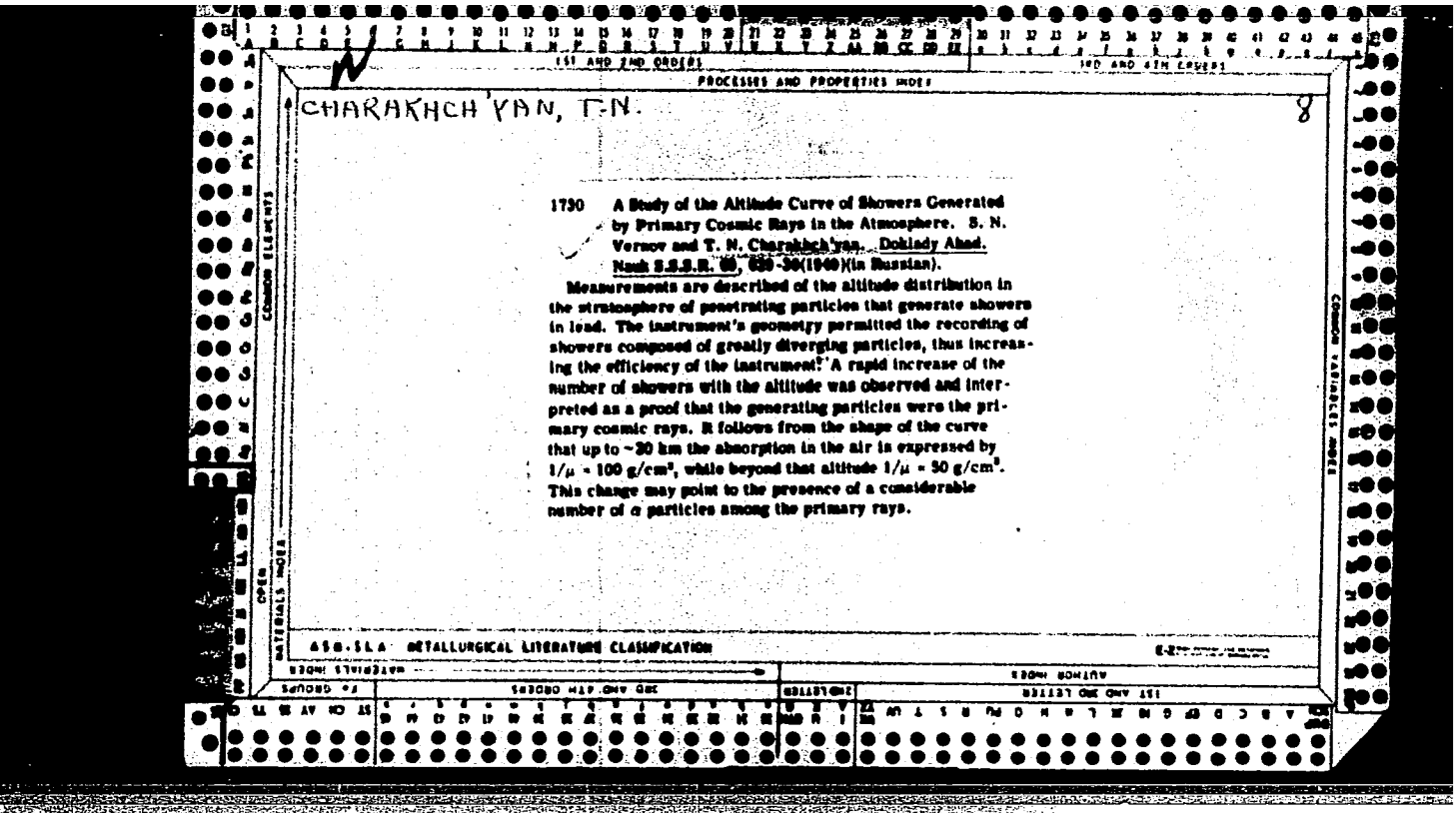
USSR/Nuclear Physics - Cosmic Radiation Aug 48
Nuclear Physics - Electrons

"Transitional Effect of Cosmic Rays in the Stratosphere", S. I. Brikker, S. N. Vernov, N. L. Grigorov, I. M. Yurreinova, T. N. Charakhch'yan, Phys Inst imeni P. N. Lebedev, Acad Sci USSR and Moscow State U imeni M. V. Lomonosov, 2½ pp

"Dok Ak Nauk SSSR" Vol LXI, No 4

Continues previous experiments (see 60T78). Measures transitional effect with various thicknesses of lead plate at altitude of 9, 20 and 24.5 km by means og balloons. Shows results graphically. Shows there is great number of electrons in stratosphere whose energy is very small ($\sim 10^8$ eV). Submitted 9 Jun 48

PA 11/49T90

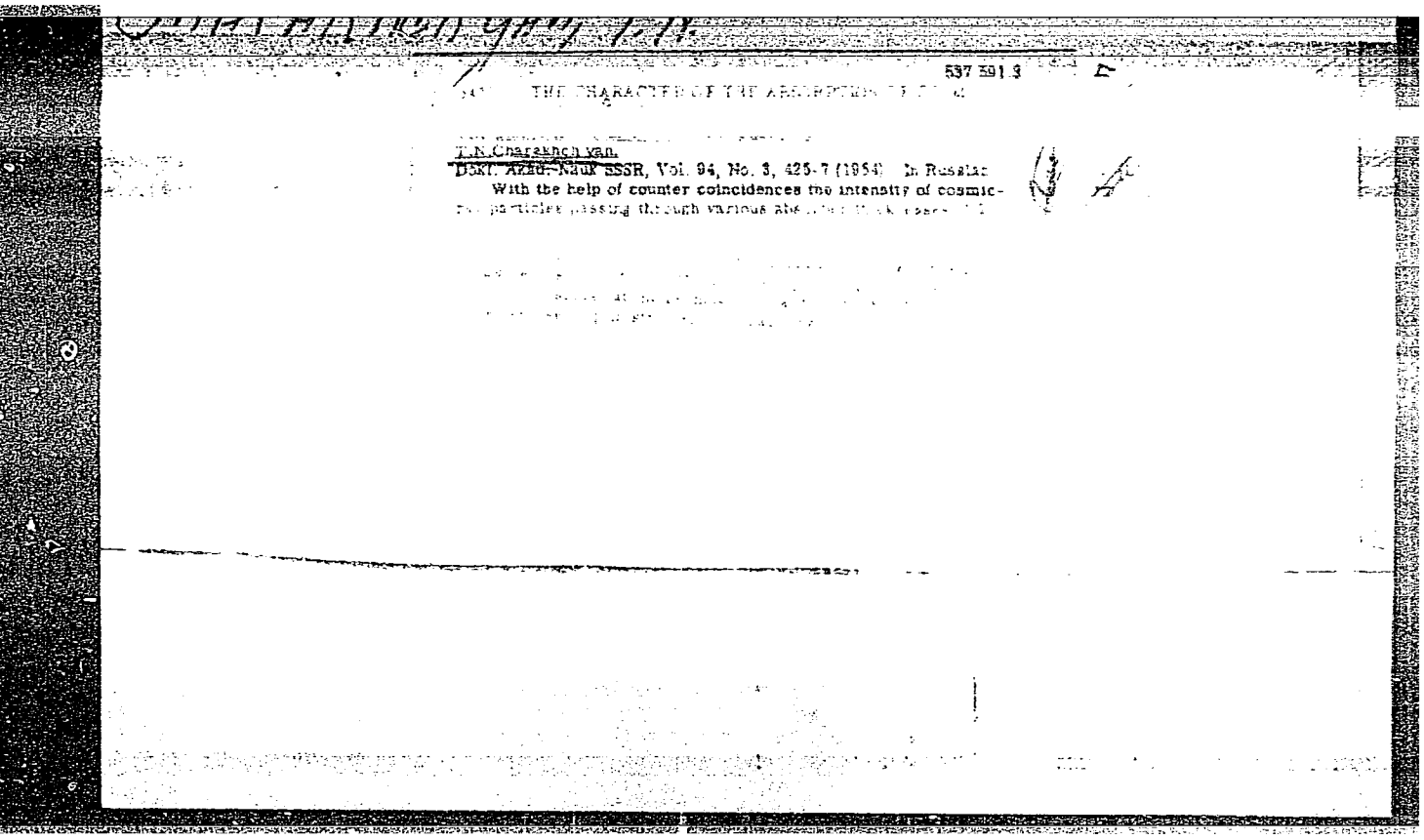


CHARAKHCH'YAN, T.N.

1730 A Study of the Altitude Curve of Showers Generated by Primary Cosmic Rays in the Atmosphere. S. N. Vernov and T. N. Charakhch'yan. Doklady Akad. Nauk S.S.S.R. 66, 659-30(1949)(in Russian).

Measurements are described of the altitude distribution in the stratosphere of penetrating particles that generate showers in lead. The instrument's geometry permitted the recording of showers composed of greatly diverging particles, thus increasing the efficiency of the instrument. A rapid increase of the number of showers with the altitude was observed and interpreted as a proof that the generating particles were the primary cosmic rays. It follows from the shape of the curve that up to ~20 km the absorption in the air is expressed by $1/\mu = 100$ g/cm^2, while beyond that altitude $1/\mu = 50$ g/cm^2. This change may point to the presence of a considerable number of α particles among the primary rays.

ASM-SLA METALLURGICAL LITERATURE CLASSIFICATION



537.591.3

THE CHARACTER OF THE ABSORPTION [illegible]

T.N. Charakhchyan.

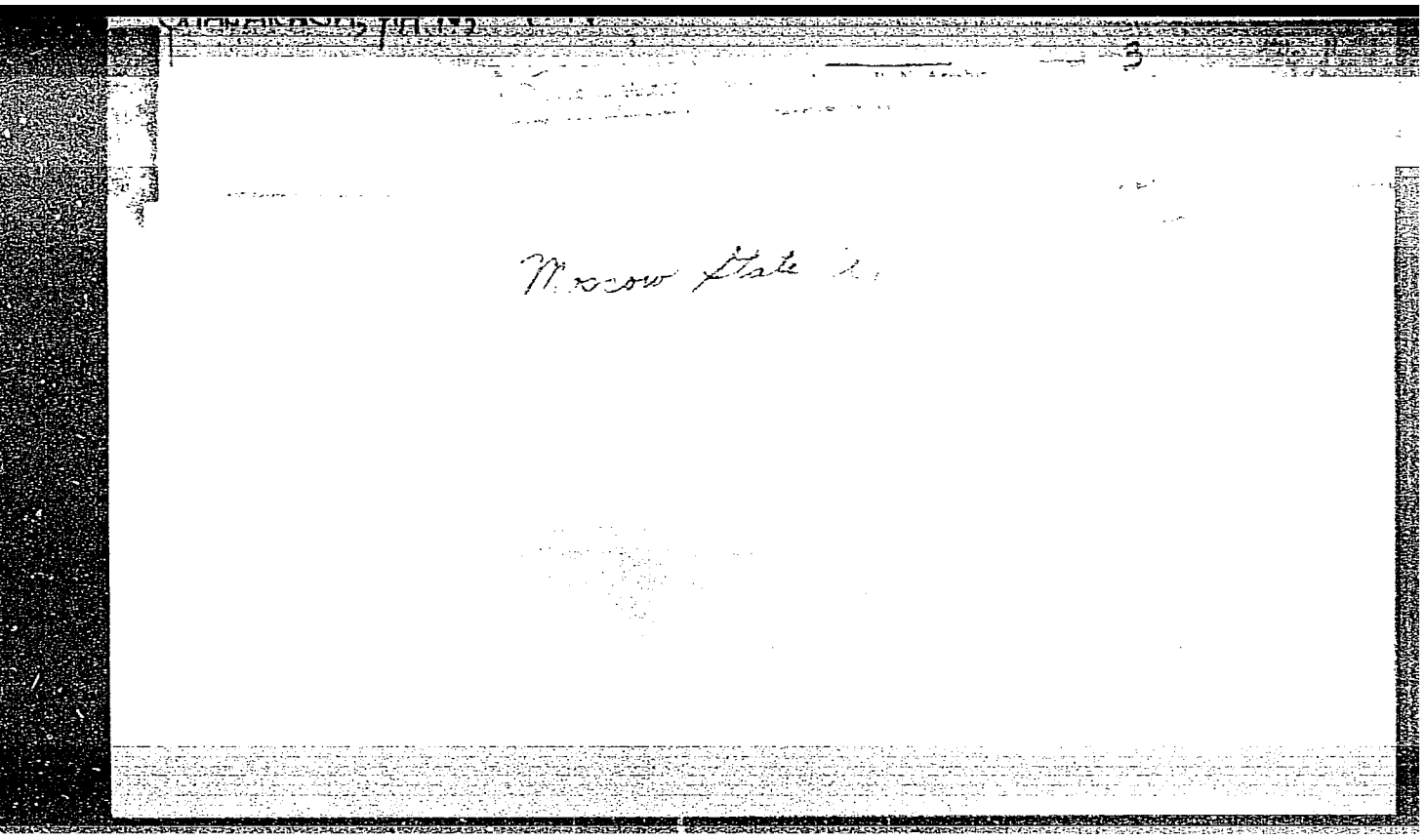
Dokl. Akad. Nauk SSSR, Vol. 94, No. 3, 425-7 (1954) In Russian

With the help of counter coincidences the intensity of cosmic-ray particles passing through various absorbers [illegible]

CHARAKHCH'YAN, T. N.

"Study of the pi-Mesons of Cosmic Radiation in the Stratosphere." Cand Phys-Math Sci, Moscow Order of Lenin State U imeni M. V. Lomonosov, Moscow, 1955. (KL, No 12, Mar 55)

SO: Sum. No. 670, 29 Sep 55—Survey of Scientific and Technical Dissertations Defended at USSR Higher Educational Institutions (15)



CHARAKHCH'YAN, T.N.

4727
INVESTIGATION OF ORIGIN OF COSMIC RAY COMPONENTS IN THE STRATOSPHERE AT GEOMAGNETIC LATITUDE 51°N. P. N. Ageshin, A. N. Charakhch'yan, and T. N. Charakhch'yan (Lomonosov Moscow State Univ.). Izvest. Akad. Nauk S.S.S.R, Ser. Fiz. 19: 533-6(1955) Sept.-Oct. (In Russian)

The available data for π^+ and π^- meson spectra generation in the stratosphere and their decay scheme make it possible to calculate the electron-photon component transmissions through the atmosphere and to determine the electron energy spectra at various elevations. Experimental study to determine the relation of the number of soft component particles to the elevation, in transmission interval, of 0.4 to 0.9, 1.2 to 2.0, 2.0 to 6.5, on 6.6 to 11.3 g cm^{-2} glass or aluminum, was made with the counter telescope at 51°N latitude. The measurements of the particle numbers in the indicated intervals were made simultaneously with four telescopes in a single exposure of the equipment in the stratosphere. Two series of measurements gave results which coincided within the limits of statistical error. The presence of a large number of low-energy electrons at shallow depth, the continuous softening of electron transmission spectra with reducing depths, and the great effect of latitudes on low-energy electrons call for new assumptions about the existence of a special mechanism for generating electron-photon components of low energies in the stratosphere. (R.V.J.)

CHARAKHCH'YAN, T.N.

USSR/Nuclear Physics - Cosmic Rays

C-7

Abs Jour : Ref Zhur - Fizika, No 1, 1958, 576

Author : Ageshin, P.Ch., Charakhch'yan, T.N.
Inst : -
Title : Study of μ Mesons of Cosmic Rays in the Stratosphere.

Orig Pub : Vestn. Mosk. un-ta. Ser. matem., mekhan., astron., fiz., khimii, 1956, No 2, 77-88

Abstract : Using a counter telescope at the geomagnetic latitudes 51° and 31° N, a measurement was made of the intensity of μ mesons with kinetic energy $< 6 \times 10^8$ ev up to altitudes of 25 km. Also measured was the altitude variation of the difference in the number of μ mesons with energies $>6 \times 10^8$ ev, traveling vertically and at an angle of 60° th the vertical. These data were used to obtain the energy spectrum of generation of new mesons in the stratosphere. At 31° N, the spectrum of the generation of new mesons with total energy $E > 7\mu\ c^2$ is of the form $G(30) =$

Card 1/2

24(5) SOV/56-35-5-5/56

AUTHORS: Charakhch'yan, A. N., Charakhch'yan, T. N.

TITLE: Measurements of the Intensity of Cosmic Radiation in the Stratosphere at Various Altitudes and Latitudes (Izmereniya intensivnosti kosmicheskogo izlucheniya v stratosfere na raznykh vysotakh i shirotakh)

PERIODICAL: Zhurnal eksperimental'noy i teoreticheskoy fiziki, 1958, Vol 35, Nr 5, pp 1088-1102 (USSR)

ABSTRACT: This very detailed and comprehensive work contains results obtained by measuring the altitude-dependence for particles of various ranges of the soft component of cosmic radiation. Measurements were carried out at 31 and 51° north latitude. The altitude dependence of electrons of a given energy is computed by means of the energy spectrum of muon production in the atmosphere. Calculated results agree well with measured results carried out at 31° north latitude, which indicates that the great majority of soft component particles consists of electrons produced by pions. Decay scheme: $\pi^{\pm} \rightarrow \mu^{\pm} + \nu$; $\mu^{\pm} \rightarrow e^{\pm} + 2\nu$ and $\pi^{0} \rightarrow 2\gamma$. Analysis of experimental and calculated values for 51° north latitude indicates the existence of an electron surplus with ranges below

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$2 - 3$ g/cm^2. This phenomenon, which is very marked at 51°, is probably caused by γ-quanta emitted in the atmosphere in reactions involving neutron evaporation. The energy flux carried away by these surplus short range electrons comprises 10% of the total energy flux of the electron component in this latitude. The magnitude of the cosmic ray energy fluxes at the latitudes of 2°, 31° and 51° was also determined (Tables 4, 5). For the energy spectrum of primary particles an expression was derived with the help of the data concerning energy flux as well as of those concerning the intensity of cosmic radiation particles on the boundary of the atmosphere at 51 and 31° north latitude. For the primary cosmic particle flux on the equator $(N_p + N_\alpha)$ a new value was computed as amounting to 0.48 ± 0.04 particles per minute.cm^2.steradian.
In conclusion, the authors thank Professor S. N. Vernov for his interest and for discussing results, and they also thank I. P. Ivanenko for valuable advice. There are 8 figures, 5 tables, and 23 references, 14 of which are Soviet.

SOV/56-35-5-5/56

Measurements of the Intensity of Cosmic Radiation in the Stratosphere at Various Altitudes and Latitudes

ASSOCIATION: Fizicheskiy institut im. P. N. Lebedeva Akademii nauk SSSR
(Physics Institute imeni P. N. Lebedev of the Academy of Sciences USSR)
Institut yadernoy fiziki Moskovskogo gosudarstvennogo universiteta
(Institute of Nuclear Physics at Moscow State University)

SUBMITTED: May 12, 1958

Card 3/3

Charakhchian, T. N.

"MEASUREMENT OF COSMIC RAY VARIATION IN THE STRATOSPHERE"
B. E. Samosudov, S. N. Vernov, V. F. Tulinov, A. N. Charakhchian and T. N. Charakhchian

Beginning with July 1, 1957 (when the IGY programme began) regular measurements have been made of cosmic ray intensity in the stratosphere at geomagnetic latitudes of 51°N and 64°N, while since March 1958 similar measurements have been taken also at geomagnetic latitude of 41°N. The measurements are made with a single G-M counter. During this period 840 stratosphere observations were made.

1. The data gathered have helped to establish the existence of a 27-day variation of cosmic rays in the stratosphere. The shape of the averaged wave is close to sinusoidal while the period is 27 or 28 days. The wave amplitude, however, changes more than 5-fold in the observed intervals. The obtained values for the amplitude of the 27-day variation in the stratosphere are 8 to 10-fold that of similar data on the Earth.

2. The existence in the stratosphere of long periodical variations of cosmic rays of extra- terrestrial origin has been discovered.

3. Values have been obtained for the cosmic ray latitude effect between latitudes of 64°N, 51°N and 41°N. It has been ascertained that the latitude effect between 64°N and 51°N undergoes substantial changes with time. The latitude effect between these latitudes in the maximum of the intensity curve amounts on the average to several per cent, and goes up abruptly with increase in altitude of observation reaching 15-20% at an altitude of approximately 30 km. Several cases of abnormal increase in

Charakhchian, T. N. (continued)

cosmic ray intensity in the stratosphere at the latitude of 64°N have been discovered.

4. A correlation between 27-day variations of cosmic retiation and the floccula on the Sun, and a correlation between the long period cosmic ray variation and Sun spots has been established.

Report presented at the International Cosmic Ray Conference, Moscow, 6-11 July 1959

CHARAKHCH'YAN, T.N.

PHASE I BOOK EXPLOITATION SOV/4413

International Cosmic Ray Conference. Moscow, 1959.

Proceedings. v. III. Moscow, 1960. 253 p. Errata slip inserted. No. of copies printed not given.

Sponsoring Agency: International Union of Pure and Applied Physics. Cosmic Ray Commission.

Ed.: S. I. Syrovatskiy, Editorial Board: G. B. Zhdanov (Ed.-in-Chief), I. P. Ivanenko (Assistant Ed.-in-Chief), N. M. Gerasimova, A. I. Nikishov, V. I. Zatsepin, B. A. Khrenov, L. I. Dorman, V. F. Tulinov, S. I. Syrovatskiy, V. M. Fedorov, Yu. N. Vavilov, and A. T. Abrosimov.

PURPOSE: This book is intended for physicists, astronomers and other scientists concerned with the earth's radiation belts and cosmic ray research.

COVERAGE: This is Volume 3 of a 4-volume work containing the proceedings of the Moscow Cosmic Ray Conference held July 6-11, 1959. This volume contains 40 reports on the earth's radiation belts and primary cosmic radiation. The reports delivered by Soviet scientists are abstracted below. References accompany individual reports.

9. Krasovsky (Krasovskiy), V.I., I.S. Shklovsky (Shklovskiy), G. I. Galperin, and E.M. Svetlitsky (Svetlitskiy). On Fast Corpuscles of the Upper Atmosphere 59-65
This paper presents experimental data on fast corpuscles of the upper atmosphere and gives a detailed description of the equipment used in the experiment.

11. Dorman, L.I. On the Problem of the Nature of Soft Radiation in the Upper Atmosphere. 74-80
This paper summarizes the available data on bursts of soft radiation in the atmosphere and investigates the nature of the bursts in relation to processes on the sun, in corpuscular streams, and in the interplanetary medium. It also investigates the nature of these bursts in relation to the properties of the Earth's belts of radiation.

12. Askar'yan G. A. On the Nature of the External Radiation Belt of the Earth 81-8[illegible]
It is stated that the external radiation belt encircling the earth is of nuclear origin, but that the explanations of the capture and accumulation of particles by the Earth's magnetic field in the course of its local variations are not convincing as an explanation of the nature of the external radiation belt. A more convincing explanation of the observed effects is given in this paper.

II. PRIMARY COSMIC RADIATION

22. Charakhch'yan, A.N., and T.N. Charakhch'yan (Lebedev Physical Institute, USSR Academy of Sciences; Nuclear Physics Research Institute, Moscow University). Energy Spectrum of Primary Cosmic Particles 129-135
This paper explains the results obtained from investigations of the electron component of cosmic radiation in the upper layers of the atmosphere.

23. Kocharyan, N.M., G.S. Saakyan, and Z.A. Kirakosyan (Kirakosyan). Spectrum of Cosmic Radiation Protons 136
This is an abstract of the results obtained in four independent experiments. The full text has been published in Russian in the Zhurnal eksperimental'noy i teoreticheskoy fiziki, 35, 1335 (1958).

(11)

83168
S/056/60/039/002/005/044
B006/B056

3.1800

AUTHORS: Charakhch'yan, A. N., Tulinov, V. F., Charakhch'yan, T. N.

TITLE: Cosmic Rays From the Sun

PERIODICAL: Zhurnal eksperimental'noy i teoreticheskoy fiziki, 1960, Vol. 39, No. 2 (8), pp. 249-256

4

TEXT: From July 9 to 21, 1959 intense cosmic-ray flares in the stratosphere were recorded in a geomagnetic latitude of 64°. These phenomena were preceded by eruptions in the solar chromosphere having an intensity of 3+ (on July 8, 10, 14, and 16). Similar observations had been made in July, 1958 and May, 1959. Measurements were carried out by means of radiosondes in the stratosphere. Fig. 1 shows the number of discharges recorded on different days (in a Geiger-Müller counter) as a function of air pressure. Fig. 2 shows the number of particles ΔN above standard as a function of air pressure, Fig. 3 shows the number ΔN of double coincidences as a function of air pressure, and Fig. 4 shows the integral energy spectrum of the primary protons. The Institut zemnogo

~~Card 1/4~~

Cosmic Rays From the Sun

S/056/60/039/002/005/044
B006/B056

magnetizma, ionosfery i rasprostraneniya radiovoln AN SSSR (Institute of Terrestrial Magnetism, Ionosphere, and Propagation of Radiowaves of the AS USSR) placed data on solar chromosphere bursts and magnetic storms at the authors' disposal. They are compared in a diagram (Fig. 5) with the data of cosmic-ray intensity peaks. Fig. 6, finally, shows the amplitudes of cosmic-ray flares (according to measurements carried out in the stratosphere and on sea level) as functions of time (for a period of 100 hours). The following summary is given: 1. The considerable intensity increase of cosmic radiation (bursts) observed in northern latitudes were due to primary protons of solar origin. The energy of these protons was higher than 100 - 120 Mev. From the slope of the straight line in Fig. 4, the index of the integral energy spectrum was determined as being 5.0 - 5.5, as for other flares 6.0 was obtained. The energy spectra of the primary protons of different bursts deviate somewhat from one another. 2. All five cases of observed cosmic-ray intensity peaks were preceded by chromospheric flares on the Sun. 3. Cosmic radiation occurred after a delay of more than 4 to 5 hours and less than 10 to 15 hours. These long periods are not in accordance with the velocities of the primary protons.

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83168

Cosmic Rays From the Sun

S/056/60/039/002/005/044
B006/B056

4. There is a correlation between the cosmic-ray bursts recorded and the magnetic storms beginning suddenly and a Forbush-type decrease of cosmic-ray intensity on the Earth. 5. The magnetic storms have little effect upon the intensity of the primary protons in the flares. A direct correlation could be determined between the amplitudes of the intensity increase of cosmic-ray bursts in the stratosphere at 64° north latitude and the amplitudes of the intensity drop of cosmic radiation in the stratosphere in more southern latitudes (51 and 41°). 6. The cosmic-ray bursts observed had a duration of the order of hours. In order to explain the results obtained in their totality, it is assumed that solar corpuscular beams function as the source of the primary protons of the bursts, which have frozen magnetic fields. The latter act as traps in which the protons are kept. The authors finally thank S. N. Vernov, Corresponding Member of the AS USSR, for discussions. There are 6 figures, 1 table, and 5 references: 3 Soviet and 2 US.

ASSOCIATION: Fizicheskiy institut im. P. N. Lebedeva Akademii nauk SSSR (Institute of Physics imeni P. N. Lebedev of the Academy of Sciences USSR)

~~Card 3/4~~

83710

3.1800 (1041, 1062, 1168)

S/056/60/038/004/003/048
B019/B070

AUTHORS: Charakhch'yan, A. N., Tulinov, V. F., Charakhch'yan, T. N.

TITLE: A Case of Strong Perturbation in the Intensities of Cosmic Radiation in the Stratosphere

PERIODICAL: Zhurnal eksperimental'noy i teoreticheskoy fiziki, 1960, Vol. 38, No. 4, pp. 1031-1036

TEXT: The authors report on a strong perturbation of the cosmic radiation recorded between May 11, and 15, 1959. The intensity increased to about twenty times the normal value on May 12, at very high altitudes in the geomagnetic latitude 64°. The discharges in a counter, and the number of coincidences in a telescope with two counters were measured. The counters were sent to high altitudes in sounding balloons. The evaluation of the data (starting of the instrument on May 11 at 10 hours 10 minutes) at Loparskaya station showed that the cosmic radiation at high altitudes was stronger than the normal value. Another balloon was launched on the same day at 13 hours. Two other balloons followed on May 12. Measurements were also made from May 13 to 17. It is seen from Fig. 1, which graphically

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A Case of Strong Perturbation in the Intensities of Cosmic Radiation in the Stratosphere

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B019/B070

represents the measured data, that the intensity was higher than the normal up to May 15. This increase in the intensity was observed also at the sea level and was accompanied by magnetic storms. From the fact that no increase in the intensity was observed in the latitudes 41 and 51°, the authors infer that the additional particles observed at the high altitudes in the latitude of 64° during these days could not have been photons. The authors discuss in detail the nature and the spectrum of the primary particles, and refer also to similar phenomena observed on July 8, 1958. They come to the conclusion that the primary particles must have been protons, and in support of it they quote American results. The general discussion of the results is given in great detail. It is mentioned that the first observations of the increase of the intensity were recorded 11 hours after an explosion in the sun's chromosphere. Further, the effect of the earth's magnetic field on the cosmic particles is discussed. The authors finally come to the conclusion that the sources of these protons are corpuscular currents with frozen-in magnetic field which were emitted by the strong eruption of the sun on May 10, 1959. The authors thank I. K. Marshanov and Yu. N. Komarov for carrying out the measurements. There are 4 figures and 8 references: 6 Soviet and 1 US.

83710

A Case of Strong Perturbation in the Intensities of Cosmic Radiation in the Stratosphere

S/056/60/038/004/003/048
B019/B070

ASSOCIATION: Fizicheskiy institut im. P. N. Lebedeva Akademii nauk SSSR (Physics Institute imeni P. N. Lebedev of the Academy of Sciences, USSR). Institut yadernoy fiziki Moskovskogo gosudarstvennogo universiteta (Institute of Nuclear Physics of Moscow State University)

SUBMITTED: August 25, 1959

Card 3/3

CHARAKHCHYAN, T.N., CHARAKHCHYAN, A.N. and TULINOV, V.F.

"Increase of Cosmic Ray Intensity in the Stratosphere in November, 1960."

report presented at the Intl. Conference on Cosmic Rays and Earth Storms, Kyoto, Japan, 4-15 Sept 1961.

CHARAKCHYAN, T.N., CHARAKHCHYAN, A.N., RYMKO, N.P., and TULINOV, V.F.

"Secular Variations of Cosmic Ray Intensity in Stratosphere Measured Beginning from July, 1957,"

report presented at the Intl. Conference on Cosmic Rays and Earth Storms, Kyoto, Japan, 4-15 Sept 1961.

31592
S/169/61/000/010/035/053
D228/D304

17.1450

AUTHOR: Charakhch'yan, A. N., Tulinov, V. F., and Charakhch'yan, T. N.

TITLE: Some data on cosmic rays from the sun

PERIODICAL: Referativnyy zhurnal, Geofizika, no. 10, 1961, 9, abstract 10G51 (Geomagnetizm i aeronomiya, 1, no. 2, 1961, 150-152)

TEXT: Cases of large flares in the intensity of cosmic rays in the stratosphere, caused by protons with energies of 100 - 200 Me V, were recorded at the geomagnetic latitude 64°. Chromosphere flares on the sun--the source of protons with such energies--preceded these flares. The suggestion is expressed that these protons are transported by solar corpuscular flows with the magnetic fields frozen in them. It is estimated that the average flow of energy born by protons from the sun in flares comprises about 5% of the flow of energy born by all the primary

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D228/D304

Some data on...

particles of cosmic rays. Certain data are cited about the degree of irradiation in the interplanetary medium at the expense of the observed flares. [Abstracter's note: Complete translation.]

Card 2/2

CHARAKHCH'YAN, A.N.; TULINOV, V.F.; CHARAKHCH'YAN, T.N.

Intensity flares of cosmic rays in the stratosphere in November 1960. Geomag. i aer. 1 no.4:494-499 Jl-Ag '61. (MIRA 14:12)

1. Fizicheskiy institut imeni P.P. Lebedeva AN SSSR i Nauchno-issledovatel'skiy institut yadernoy fiziki Moskovskogo gosudarstvennogo universiteta.
(Cosmic rays)

25185
S/056/61/040/006/006/031
B102/B214

3.2410

AUTHORS: Charakhch'yan, A. N., Charakhch'yan, T. N.

TITLE: The energy spectrum and the total number of low energy photons in cosmic rays in the stratosphere

PERIODICAL: Zhurnal eksperimental'noy i teoreticheskoy fiziki v. 40, no. 6, 1961, 1602 - 1605

TEXT: It was the aim of the authors to check whether the assumption that the main source of low energy photons in the cosmic rays in the stratosphere is the bremsstrahlung of electrons is correct. It is shown by theoretical considerations and on the basis of experimental investigations that the assumption is not correct for the weakest part of the photon spectrum in the stratosphere. On account of the electromagnetic cascade multiplication the photon spectrum in the stratosphere is an equilibrium spectrum (a spectrum integrated over the depth) according to its form. It may also be assumed that the spectrum of such low energy photons is independent of the initial energy of the electron or the photon.

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The energy spectrum and the...

This assumption is experimentally found to be right. For such an equilibrium photon spectrum S. Z. Belen'kiy has given the integral equation

$$\int_E^\infty P(E')\,W_e(E'E)\,dE' - \sigma(E)\,\Gamma(E) + \int_E^\infty \Gamma(E')\,W_k(E'E)\,dE' = 0, \qquad (1)$$

where $\Gamma(E)$ is the desired photon distribution function, $P(E')$ the electron distribution function

$$\sigma(E) = \int_0^E [W_p(EE') + W_k(EE')]\,dE'$$

the total photon absorption cross section along an avalanche unit path in the shower; W_e, W_p, and W_k are the cross sections per unit path in the shower for electron bremsstrahlung, pair production by photons, and Compton scattering by photons, respectively. The expression for W_k is very complex. It was approximated to $W_k = g/EE'$ by Belen'kiy and to $W_k = (g/EE')\left[1 + (E/E')^2\right]$ by P. S. Isayev. These approximations cannot

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The energy spectrum and the...

be for photons of less than 4 - 5 Mev. For them the exact expression of Klein-Nishina-Tamm must be referred to:

$$W_k(E'E) = \frac{g}{E'E}\left[1+\left(\frac{E}{E'}\right)^2 - \frac{2mc^2}{E'^2}(E'-E) + \frac{(mc^2)^2}{E'^2}\frac{(E-E')^2}{E}\right]. \qquad (2)$$

E' and E are the energies of the primary and the secondary photon in Mev, g = 1.32 Mev. The notation

$$\Gamma(E) = \frac{N(E)}{E}\,\frac{Z(E)}{\sigma(E)}$$

is introduced for simplicity and the function Z(E) is sought. One obtains Eq.

$$A - Z(E) + \frac{E}{N(E)}\int_E^{E_1}\frac{W_k(E'E)}{E'\sigma(E')}N(E')Z(E')\,dE' = 0. \qquad (4)$$

whose solution has the form $Z(E) = \sum_{n=0}^{\infty}\mu^n Z_n(E)$. The terms of this series are found to be

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The energy spectrum and the...

$$Z_0 = A, \quad Z_1 = \frac{E}{N(E)} \int_E^{E_1} \frac{W_A(E'E)}{E'\sigma(E')} N(E') Z_0(E') dE', \qquad (6)$$

$$Z_2 = \frac{E}{N(E)} \int_E^{E_1} \frac{W_A(E'E)}{E'\sigma(E')} N(E') Z_1(E') dE', \ldots$$

For sufficiently small E, A = 1.3. This determines the photon energy spectrum. The experimental investigations of the photon intensity were carried out by means of a scintillation counter (NaI (Tl) scintillator, and ФЭУ - 1C (FEU - 1S) photomultiplier) at a geomagnetic latitude of 51° and at an altitude of 33 - 35 km. It was found that the total flux of photons recorded exceeded the expected value almost by three times. For larger energies (> some Mev) the divergence is less. The divergence cannot be attributed to errors of measurement (which were 10 - 15%, the accuracy of the calculation being 10%). The fact that the experimental values agree with the maximal, and that the ratio of the total number of photons recorded to the total number of electrons is only slightly dependent on the altitude, show that the low energy photons in the

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stratosphere date from cascades. The authors thank I. P. Ivanenko for discussions. There are 1 figure and 4 Soviet-bloc references.

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